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East Europe Report

SCIENCE & TECHNOLOGY

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EAST EUROPE REPORT

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CONTENTS

SOVIETS DELIVER EC 1035 COMPUTER

East Berlin RECHENTECHNIK/DATENVERARBEITUNG in German Vol 21 No 1, Jan 1984 p 2

[Unattributed article]

[Text] The 200th ESER computer installation delivered from the USSR to the GDR--an EC 1035--was put into operation in the VEB Barkas Factory in Karl Marx City in November 1983 6 weeks ahead of schedule. The computer will be used as a cooperative computer center by several factories in the district for tasks under the auspices of the Ministry for General Machinery-, Agricultural Machinery- and Automotive Construction. Jointly with the territorial governmental organizations, it was possible to find a system application for the computer facility based on available construction materials and needs. Use of the EC 1035 computer for territorial rationalization will make possible an annual savings of about 450,000 man hours in the factories involved at a projected computer loading of 20 hours per calendar day. The planned loading is four shifts per day after 1984.

In the VEB Barkas Factory, the EC 1035 is the successor to the Robotron 21 and in the VEB Motorcycle Factory Zschopau it replaces the imported Gamma-10 facility. Applying interactive methods and networking with office computers makes it possible to run more than twice as many programs in a specified time compared to earlier methods.

Projects for controlling the entire production process including export accounting are run on the EC 1035. For instance, the VEB Motorcycle Factory Zschopau can operatively figure export variants with the facility. Agreements concerning computer time are worked out between the factories themselves. In addition, the VEB Scientific-Technical Center for Automobile Construction, the IFA-Combine management and the VEB Renak Reichenbach, which makes couplings, also use the EC 1035 facility.

9160
CSO: 2302/37

EDP DISPATCHER CENTER COORDINATES SUPPORT SERVICES

East Berlin RECHENTECHNIK/DATENVERARBEITUNG in German Vol 21 No 2, Feb 1984 p 2

[Unattributed article: "Territorial EDP Dispatching Center in Magdeburg District"]

[Text] Even though the EDP facilities in the Magdeburg district are operated at above average loading by the combines, factories and establishments, possibilities can be seen for even more effective use of EDP run time, especially of the ESER installations, through a cooperative arrangement. Starting with the cooperative experience between the EDP facility operators in upper management work groups, a movement was started to build up a territorial EDP dispatching center in the district involving the 13 combines, factories and establishments to undertake the following tasks:

--Territorial organization of the task of accumulating use statistics for computer stations as well as organizational centers and computer centers which now use or soon will use ESER EDP facilities;

--Support of factories and establishments in maintaining a coordinated loading plan for installed ESER EDP facilities via early transmittal of reports on computer needs and capacities, including factories which do not have their own EDP facilities.

The dispatcher of the Magdeburg EDP Center will take over tasks previously done by the facility operators relating to the compilation of comprehensive EDP statistics concerning equipment, operating systems, run times and demand levels.

In the constitutional meeting, all partners expressed the idea that other potential areas for cooperative effort can be seen, involving in particular such subjects as

--Training and qualification of personnel,

--Stepwise standardization of operating systems and

--maintenance and repair in cooperation with the Robotron Combine.

At the first information exchange concerning the EDP Dispatcher Center in mid 1984 before the District Planning Commission, proposals will be presented by the EDP Working Group relating to deepening the cooperative effort.

9160
CSO: 2302/37

INCREASE IN MICROELECTRONICS PRODUCTION REPORTED

East Berlin NEUES DEUTSCHLAND in German 16 Mar 84 p 3

[Interview with Dr Heinz Wedler, general director, Erfurt Microelectronics Combine, by Otto Luck; date and place not specified: "Mankind, Microelectronics, and the Advantages of Our Planned Economy." Dr Wedler, 56, is trained in precision mechanics, member of the SED, and holds a diploma in economics. After having held management positions in various enterprises, he has been general director of the microelectronics combine since 1978.]

[Excerpts] [Question] We are now at the point in time where increasingly broader use of microelectronics for modern technologies, in modern products, is appropriate. What level have we achieved in this respect?

[Answer] At present more than 90 percent of our microprocessors are being used in data, computer and office equipment and in control, regulation and automation technology. In the sector under the Minister for Electrical Engineering and Electronics the quality and efficiency of two-thirds of all goods production is determined by the application of microelectronics. Without our own microelectronics it would probably not even have been possible to build 32,000 robots in the GDR in just a few years. Most recently new developments from the machine building combines have all involved the use of microelectronics. Finally, let me also mention that in the GDR approximately 43,000 microcomputers have been put into use on the basis of our microprocessors.

On the other hand I do not want to conceal the fact that we definitely cannot be satisfied with the overall level of application. Which, of course, requires us as well as the potential users to increase our own efforts.

[Question] Can you explain some of the economic effects?

[Answer] In general it is true that through the use of microprocessor technology for the production of new generations of products and equipment systems we can achieve an up to 25-percent increase in work productivity, a 25 to 30 percent savings in raw materials and basic material, a 30-percent reduction in energy consumption and a 20 to 30 percent reduction in repair, maintenance and service costs. If one keeps in mind the fact that the entire industry must be directed toward renewing about one-third of its products every

year and then also consistently links this to the use of microelectronics, then there is better understanding of why this technology occupies a central position in the economic strategy which was adopted by the 10th SED Congress. And, to return to the point of departure of our discussion, there is confirmation then of why we can tackle the demands of the 1980's in such a well-prepared manner.

[Question] In conclusion, what will the competition contribution of the working people of your combine be on the occasion of the GDR's 35th anniversary?

[Answer] In this we stand fully by what was recently promised the party by all combines. We will continue the rate of development of output of the last few years: in contrast to last year net production will increase by 29 percent, goods production overall will increase by 20 percent and work productivity by almost 19 percent. In unipolar switching circuits we are increasing production by more than half. All of this should contribute to our fulfilling the high goals of efficiency of the economy. That is where our job is. To do this we shall demand a great deal of ourselves with the firm determination of making the 35th year of the existence of our republic into the year of the greatest accomplishments yet.

12124
CSO: 2302/35-A

GERMAN DEMOCRATIC REPUBLIC

METHANOL VIEWED AS ALTERNATIVE TO GASOLINE

East Berlin KFT-KRAFTFAHRZEUGTECHNIK in German No 3, Mar 84 pp 70-74

['Research--Development--Production' feature by Dr M. Wobst, engineer, Office for Standardization, Measurement and Product Testing, Automotive Department: "Alternative Fuel--Methanol and its Use in Two-Stroke Automotive Engines with Mixed Lubricants"]

[Text] The findings summarized in the following article are the results of a research assignment, compiled during my work as an assistant at the Technical University of Dresden, in the section for vehicle, agricultural and transportation technology, in the area of combustion engines and motor vehicles*.

The energy situation to date shows that petroleum has developed into the most important source of energy in the last three decades because there are rich deposits, it is easy to extract, it lends itself well to transportation and it is simple to use. However, there are limits to the availability of easily extracted petroleum, so that the increased costs of exploration and extraction are affecting the price of the raw material. Political-economic questions are similarly playing an important part with respect to the world market price of petroleum. One of the areas which satisfy their energy requirements almost exclusively from petroleum is vehicle transport. Its share of the total mineral oil consumption of the GDR in 1979 amounted to about 15 percent. Since no alternative for the present combustion engine has been found to power motor vehicles for individual or industrial use, the objective is to improve specific engine and vehicle parameters and also to provide fuels which ensure increased engine efficiency and are effectively available with respect to the particular raw material base. Taking the given conditions in the GDR as a base, with its own soft coal deposits and exclusively importing petroleum, there are several basic variations for assuring our constantly rising fuel consumption while using the same amount of crude oil. The solutions must also

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The author wishes to thank all those involved in the combustion engine and motor vehicle area for their assistance, particularly Professor Hoche, Dr Mueller, assistant professor and Mr Fuchs. Our thanks also go to the VEB PCK Schwedt, the VEB Leuna works "Walter Ulbricht," the VEB automobile factory in Eisenach and the exhaust emissions test center in Berlin-Adlershof for their willing support.

meet the special requirements of present and future vehicle numbers. The main target is the large proportion of vehicles with two-stroke gasoline engines and fuel-oil lubrication.

The existing primary energy sources and conversion processes form the kernel for future fuels. Besides the fossil energy sources petroleum, coal and natural gas, which are already in widespread use, there are substantial amounts of energy stored in oil shale and tar sands. Additional alternative primary energy sources are nuclear energy, solar energy, biomass and waste (urban and agricultural).

These primary energy forms must be converted into suitable secondary energy sources for use in combustion engines. Under discussion here are synthetic petroleum, methanol, ethanol, diesel oil, a liquid propane-butane mixture (LPG), liquified natural gas (LNG) and electrical energy (16). These secondary energy forms can be produced from several primary energy forms, the method being necessarily selected according to the specific raw material situation and infrastructure. Figure 1 gives an overview of possibly energy-favorable forms of conversion (1, 2, 3, 5, 9, 13).

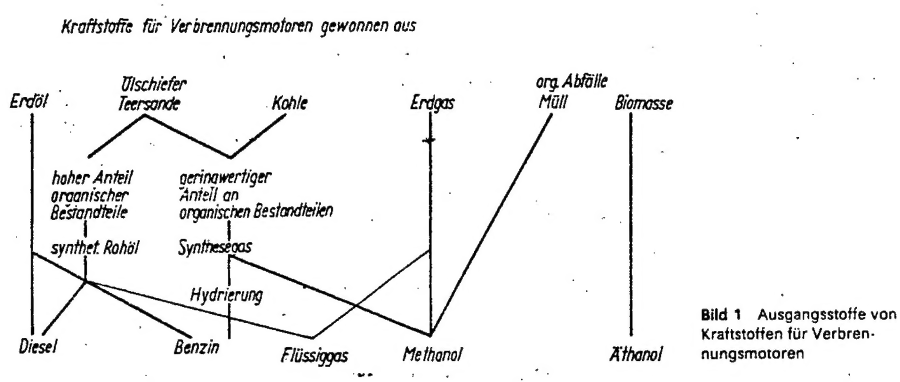


Figure 1. Basic Materials for Combustion Engine Fuels

Key:

1. Fuels for combusion engines derived from:
2. Petroleum
3. Oil shale, tar sands
4. Coal
5. Natural gas
6. Organic waste, garbage
7. Biomass
8. High proportion of organic components
9. Low proportion of organic components
10. Synthetic crude oil
11. Synthesized gas
12. Hydrogenation
13. Diesel

14. Petroleum
15. Liquid gas
16. Methanol
17. Ethanol

Alternative primary raw materials for the GDR's economy are natural gas and lignite. Methanol is prominent as a secondary energy form for both short and long-term considerations. This confirms the tendency that fuels with low processing costs offer advantages in the total expenditure; to this can be added a favorable energy balance. The need to reduce the noxious constituents in engine emissions lends additional importance to methanol compared with synthetic petroleum.

Mixing methanol with petroleum can be regarded as the first step in replacing petroleum.

Physical-Chemical Aspects

The basic physical and chemical parameters of petroleum and methanol are set out in the table. Different conclusions can be drawn from the physical-chemical properties of the fuels, which differ quite significantly in part.

Table. Physical and Chemical Properties of the Basic Fuels Used

Variables		VK 88 [Motor fuel]	Methanol
Formula		$C_{6.9}H_{14.8}$	CH_3OH
Molar weight	g/mol	98	32
Density (at 20°C)	kg/l	0.74	0.795
Calorific value H_u (2)	kj/kg	43,950	19,665
(calculated)*	kj/kg	43,250	19,530
(calculated)	kj/l	32,000	15,526
Mixed calorific value	kj/kg	2,977	3,057
G_h from calculated H_u values at L = 1, at 0°C and 101.3 kPa			
Air requirment L_o*	kg air/ kg/fuel	14.5	6.4
Boiling point	°C	35 to 200	64.7
Latent heat of evaporation at 101.3 kPa	kj/kg	293 to 377	1,109
Auto-ignition temperature	°C	230	475
Flash point	°C	-25	0
Freezing point	°C	-30	-98
Octane number	ROZ	88	110
Solubility with water	-	not soluble	soluble
Solubilty with MZ 22 oil	-	soluble	not soluble
MAK_o [Maximum Acceptable Mean Dust Particles]	mg/m^3	1,000	100
MAK_k	mg/m^3	2,000	300

* Calorific values calculated following Mendelev
* Calculated from elementary analysis mass proportions

A fundamental criterion distinguishing methanol from petroleum is the calorific value, which is considerably higher in the case of petroleum than with methanol (see Table). It is not the calorific value of the fuel that is significant for the performance of an engine but the mixed calorific value of the air-fuel mixture. It represents the calorific value of the liquid fuel, in relationship to the volume of the air-fuel mixture. Since methanol's air requirement is about one-half that of petroleum and the calorific value also comes to about one-half, the mixed calorific value of both air-fuel mixtures is almost equal.

With a mixture containing 20 percent methanol the drop in the calorifica value compared with regular gasoline amounts to about 11 percent. The mixed calorific value, the standard for the energy content of the air-fuel mixture, increases by 0.4 percent, equal to an increase of 12 kj/kg of fuel. Taking the latent heat of evaporation into consideration (when a gaseous mixture is combusted, its energy increases by the latent heat of evaporation), the corrected mixed calorific value for a 20-percent methanol mixture increases by 0.8 percent compared with regular gasoline, that is, by 26 kj/kg of fuel.

With the same stoichometric air-fuel mixtures, the engine receives slightly more energy than during operation on pure gasoline. Under the same conditions, an increase in performance can be anticipated.

Additional advantages compared with gasoline operation can be seen in the high latent heat of evaporation of methanol, the result being better filling and and higher degree of thermal efficiency. As a result of an octane number of over 110 (ROZ), the compression can be increased when engine operate on methanol, which would result in an improvement in overall efficiency. For a mixed fuel, this would mean that the octane number of the mixed fuel can be increased by adding methanol. The possibility exists that by adding methanol to low-octane gasoline a lead additive is unnecessary.

Vapor Pressure and Boiling Curve of Methanol Mixture Fuels

While boiling limits for gasoline are given as 35° to 190°C, the boiling point for methanol is 64.7°C. The boiling rate of a fuel can have a strongly negative effect on cold starting, hot starting and the warmup phase of the engine. By mixing methanol with gasoline an azeotropic mixture is formed. This means, for one thing, that the boiling rate and the vapor pressure can be influenced considerably.

Fig. 2 shows the influence of methanol on the boiling rate, when it is mixed with gasoline. An amount of methanol equal to 15 percent by volume has the effect (up to a temperature of 60°C) of raising the boiling component by 25 percent. Above a temperature of 120°C the boiling curve for methanol is similar to that for petroleum fuel. This means that with the help of the boiling curve with methanol mixed fuel, an improvement during warmup and in cold starting would be possible, as well as an improvement in the carburetion. Balancing this, the greater heat of evaporation resulting from the methanol would have a detrimental effect on the operating conditions just mentioned (cold start, warmup) and on the carburetion.

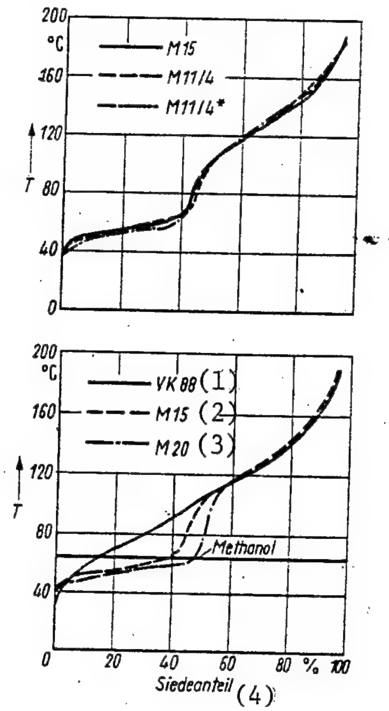


Figure 2. Boiling Curve for Gasoline Mixed Fuels, Dependence on Methanol and Amount of Solvent Agents, Amount of Oil (MZ 22) = 1:50

Key:

1. Motor fuel VK 88
2. 15 percent methanol
3. 20 percent methanol
4. Boiling component

Problems in the Miscibility of Methanol with Gasoline

In principle, pure methanol and water-free gasoline can be mixed in any ratio, bu the mixture is not stable across all temperature ranges. Basically it is dependent on:

--the methanol content,
--the water content in the methanol,
--the temperature of the mixture,
--the oil content,
--the aromatics content of the gasoline.

A division of phases, or separation, can occur if critical limits in the parameters just mentioned are exceeded. Methanol is miscible with water and, unlike gasoline, is hygroscopic, on the other hand engine is soluble in gasoline but not in pure methanol. Since studies are to be carried out specially for two-stroke engines, attention must be paid to the admixture of engine oil, particularly MZ 22.

Separation Temperature as a Criterion of Miscibility

Even a low water content in a methanol-gasoline mixture can lead to separation at a specific temperature. The cloud point characterizes this this separation temperature. The fuel mixture is clear before and after the separation, clouding, the cloud point of the mixture, occurs only at a specific temperature, the separation temperature. A dual-phase region exists below the separation temperature for the methanol-gasoline mixture, the methanol precipitating to the bottom because of its greater density. This separation of a fuel mixture is reproducible in the case of an unaltered initial mixture without any indication of hysterisis.

The tendencies for the separation temperatures to be dependent on the water and oil content are the same for the base mixed fuels in each case, but the quality of the gasoline, particularly the amount of aromatics, has a substantial influence on the absolute attainable separation temperatures (14). Discrepancies of more than 10°C could be ascertained in the absolute attainable separation temperatures, depending on the quality of the gasoline. In the case of mixtures with water-free methanol and water-free gasoline one obtains a dependency on the separation temperature based on the methanol content (Fig. 3, curve 1). Between 20 and 50 percent methanol content by volume, the separation temperature of the mixtures is approximately constant, dropping sharply with lower and higher methanol content. The separation temperature for a mixture containing 15 percent methanol by volume is -7°C, and already as low as -27°C for a mixture containing 5 percent methanol by volume. Mixtures with a low methanol content, to about 25 percent by volume, with MZ 22 engine oil added in a ration of 1:50, exhibit similar behavior. In the case of these mixtures, the separation temperatures are about 6°C higher than for the mixtures without oil. Above 30 percent methanol content by volume in the mixture and with oil added at 1:50, the separation temperatures rise sharply (Fig. 3, curve 2). With the higher methanol content there is a pronounced difference between a methanol-gasoline mixture without added oil and an equivalent oil mixture. The cause can be found in the increasing oil concentration of the gasoline contained in the mixture, the amount of which drops as the methanol content rises.

The separation temperature of a methanol-gasoline mixture is similarly dependent on the oil concentration in the gasoline as well as on the water concentration in the methanol. In the range up to 20 percent methanol content by volume, the separation temperature is largely dependent on the water content, whereas the influence from the oil additive increases sharply in the range above 30 percent methanol content by volume.

The best compromise between sensitivity to water and oil would be obtained with a gasoline-methanol mixture with 30 percent methanol by volume; figure 3, curve 4 shows the mixing behavior of various methanol mixtures when oil and water are added at the same time. It confirms previous arguments that, in the range between 20 and 30 percent methanol content by volume, the influence of both ingredients is at its lowest.

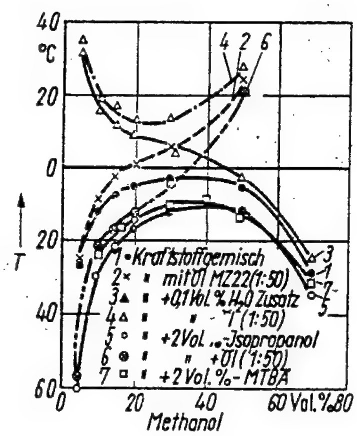


Figure 3. Separation Experiments--Chart of Cloud Points

Key:

1. Fuel mixture
2. Fuel mixture with MZ 22 oil (1:50)
3. Fuel mixture with 0.1 percent water by volume added
4. Fuel mixture with 0.1 percent oil by volume added
5. Fuel mixture with 0.2 percent isopropanol by volume added
6. Fuel mixture with 0.2 percent isopropanol + oil (1:50)
7. Fuel mixture with 2 percent by volume methyl-tetra-butyl-ethyl added

These results yield different basic conditions for the fuels to be used in two-stroke and four-stroke engines. If fuels with low and high amounts of methanol can be used for a four-stroke engine, only a narrow band, in which the mixed fuel is relatively insensitive to water and oil, exists for two-stroke engines with mixture lubrication.

The recommendation, which also results from these studies, is to employ mixtures with a methanol content up to 30 percent by volume for use in a vehicle. Fig. 4 shows the effect of adding water and oil on the separation temperature for a specific, basic gasoline-methanol mixture. In these basic studies an approximately linear dependence was established for the separation temperature on both the water content and the amount of solvent agents.

In order to achieve adequate cold stability and insensitivity to water in the mixed fuels, it is necessary to use solvent agents. Isopropanol and methyl-tertiary-butylether proved to be the most effective.

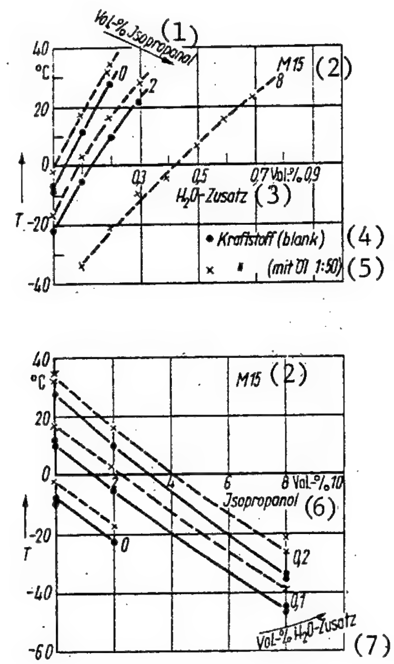


Figure 4. Separation Experiments--Chart of Cloud Point for M 15 [Fuel with 15 percent Methanol Added]

Key:

1. Percentage of isopropanol by volume
2. Fuel with 15 percent methanol
3. Added water
4. Fuel (pure)
5. Fuel (mixed with oil 1:50)
6. Isopropanol
7. Percentage of water added by volume

Methyl-tertiary-butylether (C_5H_7O), which can be manufactured from methanol and isobutanes, and isopropanol form an azeotropic mixture with methanal and gasoline, which demonstrates clearly altered properties compared with the basic mixture. Higher solubility in water and cold stability are improved.

Because no legal requirements concerning the mixture stability of fuels currently exist, the following empirical values were used as a basis to evaluate the mixed fuels (17):

a) basic stability of the mixture without added water to -30°C;

b) with 0.1 percent by volume of water added, the mixture must still be stable to -5°C.

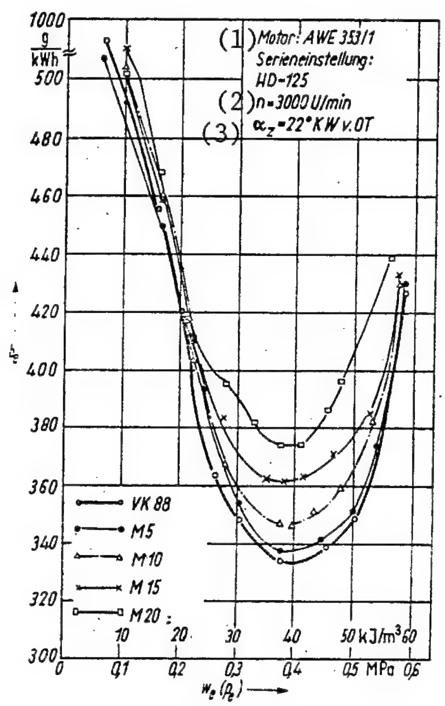
The result of these requirements and with the basic fuels used, and to replace 15 percent of the gasoline, for example, was a mixture of 11 percent methanol by volume, 4 percent isopropanol or methyl-tertiary-butylether and 85 percent engine fuel (VK 88) by volume (henceforth described as M 11/4).

An additional criterion for the use of fuels containing methanol is the presence of methanol-resistant materials in the fuel system. Radial seals, as they are presently used to seal the crankcase on the Trabant P 601 passenger car and motorcycles from Zschopau and Suhl, are proving to be unsuitable.

Test Bed Experiments Using Gasoline-Methanol Mixed Fuels

Test bed experiments were carried out on a Wartburg engine (type AWE 353/1). The basis for these experiments was a comprehensive study of the engine using VK 88 fuel under production conditions.

To provide a comparison with fuels containing methanol, fuels with a 5-percent, 10-percent, 15-percent and 20-percent methanol content were used. As anticipated, it is apparent with an increasing methanol content that the mixture is being leaned out in accordance with the decreased air requirement. Given the same engine conditions it means that, at the same carburetor setting, far less energy is being introduced into the engine with methanol mixed fuels than with pure VK 88. In addition to a lowering of effective power, this drawback is also evident in a higher volumetric specific fuel consumption (fig. 5).



[Key on following page]

Figure 5. Comparison of Methanol Mixed Fuels with Respect to Specific Fuel Consumption

Key:

1. Engine: AWE 353/1 Standard production setting HD=125
2. Engine speed = 3,000 revs/min
3. Ignition timing 22° before TDC

Because methanol ensures more economical engine operation at lean air-fuel ratios and also results in better overall efficiency (because of the lower temperature), the overall energy efficiency of the engine is more favorable for the methanol mixed fuels investigated than with VK 88 (fig. 6).

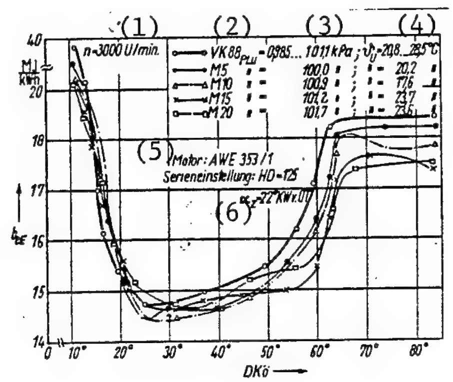


Figure 6. Comparison of Methanol Mixed Fuels With Respect to Energy-Specific Fuel Consumption

Key;

1. Engine speed = 3,000 rev/min
2. VK 88, etc.
3. Air pressure kPa
4. Air temperature °C
5. Engine: AWE 353/1 Standard production setting HD=125
6. Ignition timing 22° before TDC

An improvement in energy-specific fuel consumption could be demonstrated for methanol mixed fuels for the part-throttle range and the full-throttle range. Energy-specific fuel consumption is derived from the specific fuel consumption in each case, multiplied by the calorific value of the fuel used. The low temperature level that is the result of the high heat of evaporation and the low calorific value of methanol, could be determined by a wide variety of temperature measurements, so that in addition to lower heat losses in the combustion chamber through the cylinder wall, lower exhaust gas temperatures are also registered, depending on the methanol content.

The additional ignition limits for methanol in the direction of lean mixtures have an effect on the improvement of specific fuel consumption at high air ratios (fig. 7). A broader range with optimal fuel consumption results for methanol mixed fuels because even at high air ratios it is possible to operate the engine without ignition misses. This advantage is not directly demonstrable until the amounts of methanol exceed 10 percent by volume. The volumetric increase in fuel consumption in each case for the mixed fuels is a result of the lower internal energy of the fuel, which was referred to earlier. The compound calorific value of the combustible air-fuel mixture ultimately determines the engine's performance, and, at the same air ratio, it is approximately as high for the methanol-air mixture as for a VK-88 mixture.

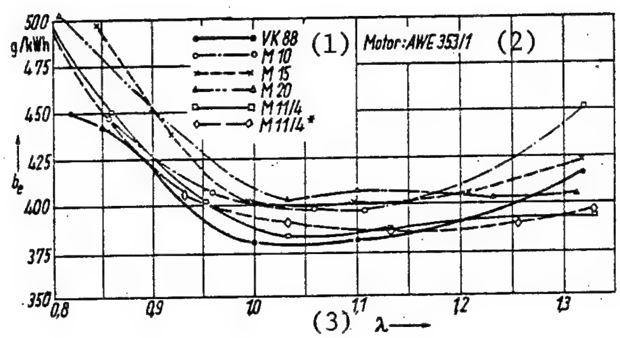


Figure 7. Specific Fuel Consumption Using Mixed Fuels Where w_e = 200 kj/m^3 (p_e = 2kp/cm^2), engine speed = 3,000 rev/min and ignition timing optimal

Key:
1. VK 88, etc
2. Engine: AWE 353/1
3. Stoichiometric ratio ($\lambda = 1$)

This holds true equally for the methanol-gasoline mixtures. This can be seen from the comparison of the maximum energy density (the maximum effective average pressure) with the same optimal advanced igntion angle and at the same air-fuel ratios in each case (fig. 8). The advantages of higher heat of evaporation do not come into play concerning the degree of cylinder filling at these relatively low amount of methanol substitute, so that no difference in the full performance of the engine can be detected as a result of the approximately equal compound calorific values of the fuels. Optimal timing to achieve maximum performance is also relatively equal, varying between 21° and 23° before TDC. As a result of methanol's higher hydrocarbon atom ratio, 4 as compared with 2.1 for VK-88, toxic emissions (CO and CH) are lower when methanol mixed fuels are used than for gasoline operation. In addition, the advantage of the possibility of lean burn for mixed fuels plays an important role in toxic emissions, because complete combustion of the fuel can be ensured with a greater excess amount of air in the combustion chamber.

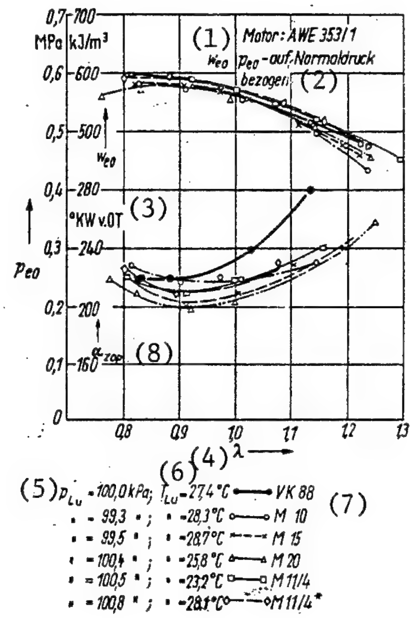


Figure 8. Energy Density (Effective Mean Pressure) for Different Mixed Fuels at Full Load as a Function of the Air Ratio at 3,000 rev/min and Optimal Ignition Timing

Key:

1. Engine: AWE 353/1
2. w_{eo} p_{eo} relative to normal pressure
3. Crank angle before TDC
4. Stoichiometric mixture ($\lambda = 1$)
5. Air pressure
6. Air temperature
7. VK 88, etc.
8. Ignition timing

It was possible to confirm this tendency for all the fuels investigated here, as the methanol content increases an improvement took place in the most important toxic substances, carbon monoxide and hydrocarbons. In the part-throttle range it was possible to achieve a reduction in CO emissions of between 80 and 100 percent at 2,000 rev/min, using M 20, compared with operation on gasoline.

Road Tests

The results obtained on the test stand could be basically confirmed in moving operation with Wartburg 353W, using methanol mixed fuels. The effect of the lower internal energy of methanol is to increase highway fuel consumption. An improvement in fuel consumption on the highway with regard to energy can

demonstrated as a result of leaning out at the same carburetor setting and the more favorable operation of the methanol mixed fuels that results, as well as on the strength of the reduced energy loss with the engine in this condition (fig. 9).

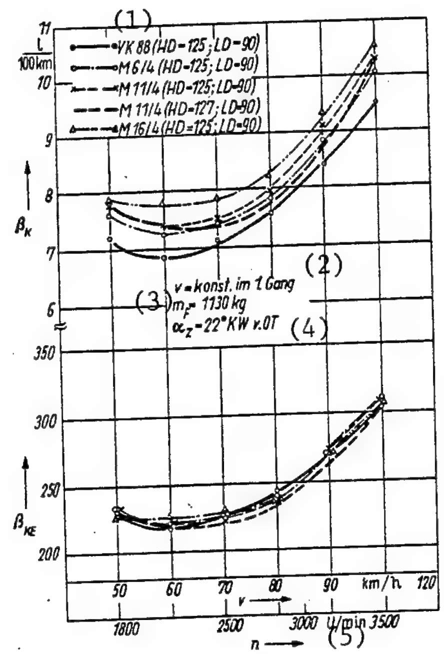


Figure 9. Average Fuel and Energy Consumption for the Wartburg 353 W

Key:
1. VK 88, etc.
2. Speed = constant in 1st gear
3. Vehicle weight = 1,130 kg
4. Ignition timing = 22° before TDC
5. Engine speed

With small amounts of methanol, up to 15 percent by volume, no effect on vehicle behavior--caused by the leaning out of the air-fuel mixture with methanol mixed fuels--can be detected, since lean engine operation is possible in principle with methanol mixed fuels. Optimization of the carburetor for the individual fuels is not necessary until methanol content by volume exceeds 15 percent and it lowers volumetric fuel consumption on the highway for M 15 at 70 km/hour by 2 percent, but it is still 3.5 percent higher than for VK 88 (fig. 10). If it is assumed that methanol, as well as the solvent agents, are manufactured from coal, this still represents a savings of 12.1 percent in refined products, compared with VK 88, at the speed just mentioned.

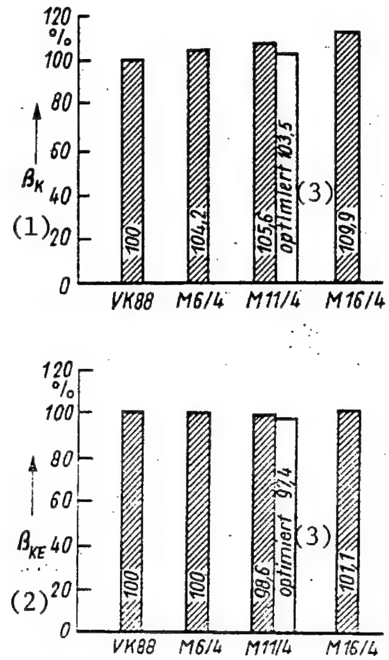


Figure 10. Volumetric and Energy Fuel Consumption for Different Fuels at a Steady 70 km/hour in 4th Gear

Key:

1. Volumetric consumption
2. Energy consumption
3. Optimized

The additional enrichment of the carburetor at full load satisfies requirements when using methanol mixed fuels, replacing up to 20 percent by volume of the gasoline. Compared with VK-88, no drawbacks are apparent in the vehicle's maximum acceleration and flexibility for the mixed fuels studied. Even under winter conditions, at temperatures as low as -15°C, no drawbacks could be determined in the vehicle's starting when using the methanol mixed fuels (with a solvent agent). At these low temperatures the warmup period was longer due to the low temperature level. At ambient temperatures above 10°C this drawback is compensated for by the larger proportion of low-boiling constituents in the methanol mixed fuels. Special warmup tests were able to confirm this, which were conducted as part of the exhaust gas studies to meet EEC regulation No 15 on the exhaust dynamometer in Berlin-Adlershof.

Besides relatively consistent fuel consumption during the warmup period, methanol mixed fuels showed significantly lower levels of CO and CH emissions,

which will make it possible to surpass the critical values of EEC regulation No 15 for CO emissions (as of 1 October 1979) with methanol mixed fuels (fig. 11).

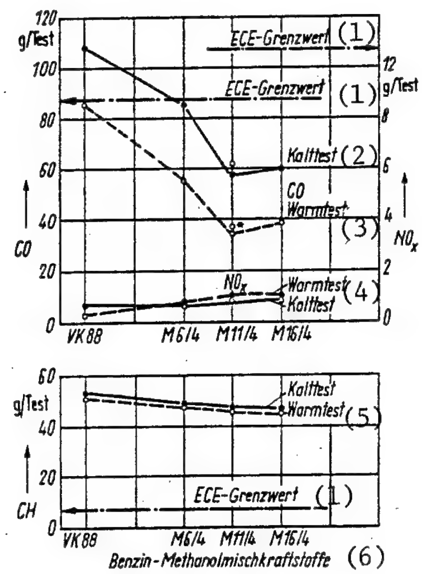


Figure 11. Toxic Emissions During the EFA Test for Different Fuels. Vehicle Wartburg AWE 353/W (production condition), EEC Regulation No 15, Model Test Critical Values Valid as of 1 October 1979 for a Vehicle Weight of 1,250 kg, NO_x Measurement With a Chemical Luminescence Analyzer

Key:

1. EEC Limit
2. Cold test
3. CO hot test
4. NO_x hot test, cold test
5. Cold test, hot test
6. Gasoline-methanol mixed fuels

Summary

Alcohols are being used increasingly as alternative fuels on an international scale. Depending on the availability of raw materials, alcohol derived from plant products and methanol from coal or natural gas have become accepted, with the manufacture of methanol from natural gas using the steam reformer without doubt representing the simplest method.

For 100,000 tons of methanol 295 million m^3 of natural gas are needed, if raw lignite were used, 752 millions tons would be required.

The advantages of methanol as a fuel are to be seen in a higher exploitation of energy and lower exhaust emissions. Furthermore, the investment to use methanol in a vehicle is minimal and requires no new transportation, storage and handling system in the marketing of fuel, if methanol-resistant materials are used.

It is possible to use methanol as a fuel in both diesel and gasoline engines. A gradual admixture of methanol as a mixed fuel proves to be the most effective method. Problems with mixture stability and reliability in cold weather can be solved with suitable solvent agents. The precondition for using fuels containing methanol is the installation of methanol-resistant materials in the fuel system. The studies show that a technical solution to methanol-specific problems to allow it to be used in cars is possible, but these problems require joint measures to accomodate on the part of the chemical industry and the vehicle manufacturers.

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9581
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PROFILE OF MICROELECTRONIC TRAINING PRESENTED

Budapest HIRADASTECHNIKA in Hungarian No 1, 1984 pp 15-19

[Article by Gyozo Dioszeghy: "Concerning Microelectronics Expert Training"]

[Text] Gyozo Dioszeghy obtained his electrical engineering degree at the Electrical Engineering School of the Budapest Technical University. He worked for 17 years--in various assignments--at the BHG [Beloiannisz Telecommunications Factory], in the area of manufacture and development of transmission equipment and telecommunications parts. For 4 years he was chief engineer of the Servintern ISZ. Since 1970 he has been professor and deputy director in chief at the Kalman Kando Electric Industry Technical College. The professional area cultivated by him is applications and measurement technology for electronic parts and microelectronics; he also deals with organizational and educational questions of higher technical education.

The basis for the article is a study prepared by the author for the Electronics Central Development Program and a lecture given at a session of the HTE [Telecommunications Scientific Association] 28 March 1983. The article starts from the present situation of electronics education and then, on the basis of several observations pertaining to professional education, describes the requirements in education at various levels.

1. Introduction

A study was prepared, as government commissioner for the Electronics Central Development Program (EKFP), with the purpose of surveying the present situation of professional cadre training, taking into consideration and necessary changes in the production structure of the electronics industry and making suggestions for the substantive and organizational development--primarily of middle level cadre training. It is natural that when working out the proposal one had to take into consideration the present situation of lower, middle and higher education, the changes to be expected, the prospects and the government level decisions going into effect. One had to analyze, at the various levels of the educational hierarchy, the professional expectations, concretely designating the professional details of the study material, the objective and subjective conditions for training, technological questions and the expected trends of development.

In the study we spoke briefly of the past of the Hungarian electronics industry (telecommunications, instruments, parts manufacture, etc.), of its traditions, of the computer technology culture and of our educational system--of all those most important factors which might influence the concept to be developed.

It should be noted that the study was prepared during the development of Hungarian educational reform, in a period of steps thought of and decided upon. This fact is important because from the viewpoint of implementation it might influence--hopefully positively--the decisions pertaining to implementation. We are striving to see that in the proposals pertaining to education a role should be played by everything which might be used in this area in accordance with the traditions of the Hungarian electronics industry, at the same time eliminating those problems which might represent a fundamental obstacle to development (for example, lack of technological discipline).

Finally, we would note that the study deals with the basic questions of expert training in the electronics industry, but the proposals are directed primarily at a solution of training middle-level cadres in microelectronics.

2. The Present Situation of Electronics Education (Day Education)

Training Graduate Engineers

The patron and responsible party is the Electrical Engineering School of the BME [Budapest Technical University]; the training time is 5 years.

It is not the purpose of the study to deal in detail with this level. We consider it important to emphasize that the Electrical Engineering School of the BME has proposed a new study plan and a reformulation of training goals--in connection with the requirement of the new educational conception. It will submit its recommendations to the chief authority soon. These goals, naturally, are in harmony with the resolution of the Politburo of the MSZMP concerning the status and development of higher education and with its short and long-range development goals.

We will not discuss the details here, but let us stress a few more important things:

--a microelectronics and technology section must be created in the Electrical Engineering School of the BME,

--the operation of the following sections is proposed in the Electrical Engineering School of the BME: a communications industry section, a heavy-current section, an instruments and guidance technology section, and a microelectronics and technology section;

--the need for development has made it necessary to change the names of the several branches (for example, in the microelectronics and technology section--an electronic devices branch and a parts technology branch), naturally with regard to the substantive changes.

It must be emphasized that when the study was being prepared all these were merely proposals, but their approval is expected shortly.

Postgraduate Training in the Electrical Engineering School of the BME and in the BME Further Training Institute

This form provides high-level instruction for graduate electrical engineers to acquire new information, in 2, 3 or 4 6-month terms. In case of need it also satisfies special demands (for example, the "microelectronics design" course asked for and supported by the Microelectronics Government Commissioner in 1982).

Training Factory Engineers

The training goal of the technical colleges founded in 1969 was to train practical experts with a good theoretical foundation who would work in their professional aresa in manufacture, technology, operations, development, service, customer service and other services.

The training time is 3 years.

Experts of this type for jobs in the electronics industry are trained primarily at the Kalman Kando Electric Industry Technical College (KKVMF), but the activity of the Transportation and Telecommunications Technical College (KTMF) in regard to telecommunications and of the Machine Industry Automation Technical College (GAMF) in the area of automation should be mentioned too, joining in the professional tasks of the KEFP [Electronic Central Development Program].

The training taking place at the KKVMF affects the EKFP in the following sections:

--the communications industry section;

--the microelectronics, parts and devices technology section;

--the instruments and control technology section;

--the computer technology sections (in Budapest and Szekesfehervar); and

--in automation training by the heavy-current section.

At the time the study was being prepared--simultaneous with the development of a new study plan structure by the Electrical Engineering School of the BME--the KKVMF started a partial study plan correction in the electronic parts and devices technology section. The preparations were made in

cooperation with the Electrical Engineering School of the BME in the interest of having training at the two levels cover one another well. The proposed correction is awaiting approval by the chief authority; we will turn in detail to the professional content in the second chapter of the study.

For the sake of completeness we should mention the training activity of the KTMF and the FAMF; the former is called upon to satisfy the training of experts working in enterprises and institutions belonging to the KPM [Ministry of Transportation and Postal Affairs] and the latter trains in general some of the experts in automation, certainly affecting the EKFP.

Technician Training

The technician training originally based on the higher industrial schools ended at the end of the 1960's; this task was taken over in part by the trade secondary schools--in my opinion in a somewhat distorted manner. It should be noted that people are still called technicians under unique conditions, but this has little effect on the concrete special area of electronics.

After a social debate lasting several years the Presidential Council ordered (Law Decree 43, 1982) the training of technicians and the organization of technikums within the framework of trade secondary school education.

We will turn in detail in the second chapter of the study to the consequences to be expected from the decision of the Presidential Council--in regard to the training of electronics (microelectronics) experts. We feel that the training of technicians, representing an important link in the training of middle technical cadres, should be regarded as one step in training--even in the period prior to the realization.

Skilled Worker Training

We will discuss only the training of skilled workers affecting the electronics area in the system of public education now in effect:

--skilled worker training in trade secondary schools,

--skilled worker training based on graduation from a gymnasium, and

--skilled worker training based on the general schools.

The decade of the 1970's brought absic changes in skilled worker training. These schools were taken out of the sphere of authority of the KGM [Ministry of Metallurgy and the Machine Industry], now the IM [Ministry of Industry], which guides the electronics field, and put into the sphere of authority of the MM [Ministry of Culture] (OM [Ministry of Education]). Practical guidance was taken over by the councils--as is the case for general schools and the gymnasia. The background institutions of the professional ministries

continued to exercise professional supervision; the former Ministry of Labor Affairs also undertook a role in skilled worker training. At the same time, the large factories representing the electronics profession were not affected in the skilled worker training (for example, the trade secondary schools which were functioning well maintained contact with the factories by signing social contracts).

In this part of the study we limit ourselves to setting down the facts, we do not undertaken an evaluation, but naturally we do make observations pertaining to the character and quality of training--in regard to the professional area of electronics.

Skilled Worker Training in the Trade Secondary Schools

Electronics--as is well known--is one of the most swiftly developing professional areas; this makes necessary the laying of natural science foundations and the acquisition of theoretical knowledge at every level; but the practical, manual skills must be developed also. A skilled worker in electronics must be capable of absorbing new information. The skilled worker is primarily the one who applies or implements the technology;in the final analysis he masters this skill or proficiency in the course of practicing his trade, doing his work.

The heterogeneous nature of the predecessors of the present trade secondary schools (the gymnasia and technikums) and the insufficient supply of tools (machines, instruments, etc.) caused many problems in the training of skilled workers in the trade secondary schools; it was not possible to train experts "ready for anything" at this level either.

Skilled worker training takes place in the trade schools in the following trades:

601 electronic instrument technician;

603 office machine technician;

608 radio and television technician;

609 control technology instrument technician;

612 computer technology instrument technician;

613 aircraft instrument technician;

614 electric instrument technician;

2204-1 cable telecommunications instrument technician;

2204-2 wireless telecommunications instrument technician; and

2205 railway communications and safety equipment technician.

We felt it necessary to give a detailed listing within the framework of this study in order to support later evaluations, conclusions and proposals.

In addition it seems essential to append supplementary notes to the several specialities:

ad 601: the training of electronic instrument technicians is directed toward the medical specialities (?) [as published];

ad 603: the training of office machine technicians is based on precision engineering;

ad 609: the special training of control technology instrument technicians is oriented toward computer technology too;

ad 613; an aircraft instrument technician studies basically navigation instruments and equipment;

ad 614: the professional material for an electric instrument technician contains the thematics for an electronic instrument technician; and

ad 612, 2204-1, 2204-2 and 2205: the training of aircraft, cable and wireless telecommunications and railway communications and safety equipment technicians is directed at training operating and maintenance technicians under the supervision of the KPM.

A smaller part of those trained in trade secondary schools--those with a secondary school diploma--study further in the technical university or colleges.

Skilled Worker Training Based on Graduation from a Gymnasium

The training lasts 2 years. The basic training and general culture acquired in the gymnasium provide a good foundation for electronics technician training, but the level of training is hurt by the fact that in the course of prior selection the great majority of the better students are oriented toward higher education and many feel that this training possibility is a stopgap arrangement. The lack of the awareness of a professional calling (at least at first) is characteristic. The trades taught--with the exception of 603, office machine technician--coincide with what was listed for the trade secondary schools.

Skilled Worker Training Based on the General Schools

The training lasts 3 years. Training in trades touched on in the study--for example 614, electric instrument technician--takes place in this framework. In our opinion the lack of the necessary basic, theoretical information makes it impossible to train the students at the required level so we forego further details. We are recommending that it be abolished--in the electronics area, naturally.

On-The-Job Training

We cannot talk about organized training here, although its role is important, especially in the large electronics factories. We should include here the laboratory technicians also, who are indispensable primarily in performing the detailed technological operations in the manufacture of electronic (microelectronic) parts. We should continue to see to the organized training of the best of them outside of worktime--within the framework of high-level evening instruction for small groups.

3. A Few Other Observations Pertaining to Professional Training

The Present Situation of Evening and Correspondence Training

The present function of evening and correspondence training has been modified in part and it is now going through significant changes. Up to the mid-1970's the number of people in evening or correspondence training in our homeland approached and in some specialities exceeded the number of participants in day training. This characterized electronics also which, by its nature, understandably, attracted and encouraged study by unskilled workers; it even attracted (and still does) people from other trades.

The chief criticism of evening and correspondence training is that the diploma and training acquired there are not equal to what is acquired in day classes; the level of the training and the value of what is learned are lower.

The number studying in or graduating from evening or correspondence branches has decreased--at every level of the professional hierarchy--and a further decrease is to be expected. At the same time, effective efforts are being made to increase the level and realize equality between the day and the evening or correspondence diploma and training.

Naturally we cannot talk about completely abolishing evening and correspondence training. Social mobility, unavoidable career corrections and special needs will continue to require the possibility of study while working, but with a significant increase in quality and a further reduction in the number involved.

Introducing Technical Subjects in the Study Plan of General Schools

Today already, according to every new study plan, technical subjects are taught in the general schools. We are convinced that this fact--by increasing technical culture--will aid the selection of a career, arouse interest in technical careers and orient better human material, among other things, toward the electronics area.

Personal and Material Conditions for Training

Discussion of this sphere of problems would require a separate study, so we can only try to give an outline of the situation at various levels of electronics training, not free of subjective impressions. In our opinion the personal conditions for higher education (university, college) are certainly more favorable than those for middle- and lower-level education. An entire series of outstanding professors, researchers and scientists participate in higher education; the intellectual capacity is very great. But it is gratifying that the level and training of middle- and lower-level instructors show a developmental trend also.

In regard to the material conditions for training we can call the software side relatively good. The professional literature is accessible--even in the present difficult economic situation. Many books and publications in the Hungarian language are appearing. But there is little technical training software (films, microfilms, media, etc.).

The situation is very bad in regard to hardware. The teaching of electronics at every level requires expensive equipment, this becomes obsolete very quickly, and despite this it is difficult to obtain.

The methodology of instruction requires a significant development also. By developing this we might alleviate the problems caused by the poor supply of tools.

4. The Requirements of Electronics (Microelectronics) Training in Instruction at Various Levels

In our opinion the new study plan proposal of the Electrical Engineering School of the BME defines well the professional divisions and branches, basic and special themes and subjects of electronics or microelectronics; looking to the future it provides a conception, goals and modern methods for instruction. In the present stage of development, taking into consideration the achievements of the EKFP to be expected, we must reckon with a change in the structure of the electronics industry, paying careful attention to a definition of electronics and microelectronics, to general and special applications and to the correct ratios.

The training of experts takes place in the Electrical Engineering School of the BME, as we have seen, in three specialities in addition to heavy current:

--telecommunications,

--instrument and control technology, and

--microelectronics and technology.

We might call the three together the electronics area, all the more so since the specific unique aspects are separately defined according to the specialities also.

The microelectronics and technology section appears independently. Its task is to teach the planning, design, manufacturing processes and technology of electronic subassemblies, system elements, microelectronic devices and parts. It provides information on modern electronic devices, circuits, their design, manufacturing and technological processes and manufacturing and technological equipment.

It is worth mentioning a few important study plan development goals:

--basic training must be strengthened and made as uniform as possible;

--independent activity must be increased;

--the effectiveness of basic training in computer technology must be strengthened; and

--the digital technique approach must be developed.

Completely agreeing with what has been listed and taking into consideration also the goals of middle- and lower-level expert training, all this should be supplemented:

--there must be a further increase in the deliberate strengthening of practical abilities;

--modern, new forms of the man-machine link must be developed; and

--stressed attention must be turned to adherence to technological discipline at all levels and to the cleanliness and hygienic requirements of the factory.

The professional structure of the BME Electrical Engineering School and of the KKVMF are nearly identical; the division and designation of the specialities belonging to electronics training are almost completely identical--as a result of the correction.

The professional division of skilled worker training, as we have seen, deviates from these unjustifiably and, in our opinion, the information needed by a skilled worker in electronics does not figure in the thematics to the degree required. It follows from all this that we consider the university and college instruction conceptions, goals and thematics appropriate, presuming that the new study plan proposals (RME) and corrections (KKVMF) are approved. But we must talk about the goals, thematics, methods and even organizational questions of the training of middle- and lower-level cadres.

Goals and Thematics for the Training of Skilled Workers and Technicians

Electronics (microelectronics) skilled workers are the practical implementers of production; for this reason they must acquire much practical experience, in addition to optimally selected basic and professional theoretical information, especially in learning and using the various technological processes (carrying out technological operations and auxiliary operations, evaluating simpler measurements, etc.).

The training of a microelectronics skilled worker requires special training.

The thematics for training a microelectronics technician naturally include everything which the skilled worker thematics contain. The technician is a middle cadre trained to implement product on at a high level; for the precise application of the technologies, he must know everything which the skilled worker knows; but his theoretical preparation--because of the character of his training--is at a higher level and has a broader spectrum (for example, setting up technological operations, measuring and evaluating the semiconductor devices, etc.).

Methodological Questions of Skilled Worker and Technician Training; Educational Motives and Vocational Awareness

In an earlier chapter we dealt only with the goals and thematics connected with the training of microelectronics experts.

In regard to the training of electronics skilled workers and technicians we note that the most important information pertaining to microelectronics--especially from the side of applications--must be built into the electronics study plans. The organization of instruction in higher education in the recent past offers a good example in this regard.

In our judgment the training of electronics skilled workers can be based only on young people who have graduated from secondary school or a trade secondary school and who have the required natural science and general information foundation. This supports the important conditions formulated in the proposed thematics, especially in regard to the basic subjects (mathematics, physics, chemistry).

It is worth noting that in the opinion of experts who have spent some time in developed industrial countries (the United States, FRG, Japan) it is of fundamental importance to influence properly the attitude of the future experts. This pertains primarily to adherence to technological discipline, to handling equipment, to assuming responsibility for the work done. Realizing this attitude is one of the most important tasks; all sorts of methods must be used to realize it (moral, material interest, methodological, didactic, emotional effects, etc.).

A few words must be said about the historical background of the Hungarian electronics industry. Beginning at the end of the last century and up to most recent times it can be demonstrated in an exact manner that the Hungarian electric industry, and the electronics industry therein, played an important role not only in Hungarian economic life but also in the international division of labor. The significance and importance of all this must be acknowledged in every area of expert training, with moderation and free of nostalgia, but in the interest of developing vocational awareness appropriately.

It would seem to have no close connection with the theme under discussion, but it is very important that there be an appropriate propagation of knowledge about electronics, including microelectronics, in Hungarian society to influence public opinion. On the one hand, we must overcome the mystification of this professional area and, on the other hand, we must increase the possibility that can be realized in this profession in the area of making use of intellectual capacities. We cannot go into details, but we must refer to the significance of the mass media, films and literature spreading popular knowledge.

We must return to the subject of technology as taught in the general school and the gymnasium. Electronics and microelectronics must be brought into the sphere of knowledge of the young generation. Teenagers are very receptive to the new, to what was unknown before; so this theme must be built into the subject of technology, or rather this subject must be expanded with this theme--in a unique, popular style.

Taking into consideration the good and bad experiences in spreading the computer technology culture we must deal--although in an indirect way--with games containing electronic elements in connection with the games of children 4-10 years old. There should be a breakthrough in this area. All those devices which are based on microelectronics (simple electronic organs, various sport and logic games, electronic controls, etc.) might be considered. We cannot discuss here the pedagogical effect of this, the significance of it in connection with the spread of the electronic culture. Going beyond this, however, we must call attention to the social effect of the manufacture of well selected electronic games, and to the economic significance of possible export. Let us think only of the hubbub of the Christmas toy fairs or of the bleakness of the offering of Hungarian toy stores.

We must rely on the active cooperation of the technical social societies (the HTE, MATE [Scientific Association of Measurement Technology and Automation], the J. Neumann Society, etc.) and the active cooperation of the MTESZ [Federation of Technical and Scientific Associations] in general in the spreading of the electronic culture and in the training of experts. We attribute great significance to their opinions, criticism and recommendations on the study plan conceptions and educational goals but neither

can we ignore the activity they carry out in spreading the electronic culture. We recommend, for example, that they continue to provide training for those teaching technical subjects within the framework of itinerant education, in the area of electronics (micrlelectronics).

Consultations with experts acquainted with the theme and a study of conceptions and decisions preceded the compilation of this material, but the author developed the conclusions and recommendations according to his own, private opinion.

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PAPER PRESENTS SURVEY OF MICROELECTRONICS ENTERPRISE

Budapest NEPSZABADSAG in Hungarian 25 Feb 84 p 4

[Article by Katalin Bossanyi: "A New Factory for the Technical Change of Epoch"]

[Text] The economically most significant and technically most exciting part of the microelectronics central development program is the full realization of the development, design and manufacture of integrated circuits. The basis for this is the Microelectronics Enterprise (MEV) founded 2 years ago. The first phase of the investment for the elements which are the soul of integrated circuits--so-called chip manufacture--is being completed now in the MEV, with its center in Ujpest. In March, the representatives of the Soviet enterprises providing the license and the greater part of the technology handed over to Hungarian experts the first manufacturing line of the new element factory--in the wake of the successful factory tests thus far. In our report, we will describe the factory, which can be worthily called a technical change of epoch, and a few of the achievements and problems of the program thus far.

The first thing to note is that the integrated circuits manufactured by the MEV can be used for an extraordinary variety of purposes, but first of all they make possible the modernization of computer and signal technology, guidance and control of the most varied machines, equipment and plants, with a good bit less material, energy and manpower expenditure than with earlier methods.

Thus far we have imported, in the overwhelming majority of cases from capitalist countries, the miniature electronic parts which are called briefly IC's. The new chip manufacturing plant of the MEV--which will cost 1.9 billion forints together with service installations and supplementary developments--will be capable of processing 120,000 silicon wafers per year. Depending on the complexity of the circuit, one can make from such a palm-sized round silicon wafer from several hundred to 10,000 or 20,000 chips. But let us enter this micro world which still seems so mysterious, reminding one of science fiction. My guide, chief engineer Gyorgy Telegdy, leads me through long corridors from which we enter a large, glass-walled building.

"This is a larger box in which there is a hermetically sealed, metal-walled smaller box," he explained. "But we can go in there only if we dress from head to foot in a white hooded gown and pass through a lock system. The manufacture--working with a precision of a thousandth of a millimeter--requires special protection and cleanliness conditions. This means that in the plant we must maintain a constant supply of air of great purity in addition to definite temperature and moisture content. The working conditions require organization and discipline which are completely new--under domestic conditions. For example, because of vapor one cannot talk while facing the work piece and one cannot make fast movements, because this could disturb the air, nor can one go from one worksite to another without permission."

Now, of course, the prescriptions are not so strict because, due to putting things into operation and teaching the personnel, there are a good many more people in the plant than the experts who will be needed during manufacture. One can tell only from the voices who is who--there is a mixture of Russian, German, English and Hungarian words--because everyone is working in white protective clothing and masks. They are checking the machines and the Hungarian workers who have already mastered the complex technology but who are still under supervision.

We also became acquainted with the chief stations of the chip manufacturing technology, consisting of 60 or 70 operations. The silicon sheets are cleaned with chemical methods. A specially equipped shower stall can be seen near the mixing, circulating and washing equipment; if the poisonous chemicals should splash out despite the strict safety system, the workers can clean themselves immediately. The service corridor stretches between the chemical worksites; one can sense well here what a complex assortment of electronics and instruments is needed to produce the even more complex electronic parts.

The photolithographic worksite bathed in yellow, filtered light produces a strange feeling also. Here they coat the clean silicon wafers with a light sensitive lacquer, then they make the layers soluble or insoluble with special adjusting-illuminating equipment. Then further processing is done with plasma baking without having the wafers touched by humans. The tool for this is a special microprocessor device which achieves the greatest working precision in the history of technology thus far. The diffusion heat treatment also presents a strange--even unearthly--spectacle. Gas atoms in the tubes are inserted into the crystal structure of the silicon wafers at a temperature of 1,250 degrees Celsius. With the naked eye one cannot see the grooves containing the millions of bits of information. One must also mention a special device--which might best be compared to a particle accelerator. A spherical computer-controlled ion-implantation device implants additional material into the wafer. The operator working here--although the computer carries out every task--gets special hazard pay. Finally the masks of the several tens of thousands of chips, capable of many tasks and different from one another, are drawn on the silicon wafer. They are checked--separately, operation by operation--with a microscope and special test equipment. The chips will go from the

Ujpest factory of the MEV--in special protective packaging--to Gyongyos; here they assemble and test the micro elements, from whence they go to the users or into trade.

Ferenc Banyai, technical director, said: "We are now in good shape with the investment for the first chip-manufacturing line. The auxiliary developments are finished also--for example, the air-conditioning system and the equipment supplying high purity water and gas. We can begin to install the second line--the so-called bipolar chip-manufacturing line--by the middle of the year. All this does not mean that there has not been some slippage in the investment compared to the original thinking. Much has changed in the meantime; some capitalist equipment of key importance has been embargoed, the acquisition of others was made difficult by domestic import restrictions, and not all the equipment from socialist countries arrived on time. So the realization of this investment, requiring special technical and human preparations, has shrunk to not quite 2 years, which has been a big test for the entire enterprise--since we are the prime contractors also. Just think, delivery of the machines began just last year, in the first half of the year. On one day we received 16 carloads of goods; lacking a warehouse the placement and protection of this caused no little headache. So we could start test operation only at the end of last year."

Operating the first chip-manufacturing line in two shifts will require 100 operators, that is skilled and semiskilled electronics workers, in addition to specially trained engineers and technicians. And although the MEV has started a number of in-house study courses in addition to retraining and reassignments there are not yet enough applicants. They can only offer this extraordinarily interesting, new trade to young people who have graduated from secondary school. And it pays well also; as a result of incentive pay an operator can earn 4,500-5,000 forints per month. It may contribute to the present reluctance that few are aware of the possibilities here.

And this problem leads to another area of the microelectronics program, one pregnant with tension. Because what is happening with the first technological phase, one which determines the modernization of IC manufacture, the development of computer development and design? The two high-performance computers with special peripherals, displays, sensors, drawing tables and graphic and text terminals are working already in the MEV. The test and control rooms have been built, but for the most part the making of the masks, indispensable for development and design, is still being done in the older plant of the MEV and in the KFKI [Central Physica Research Institute]. Mask manufacture corresponds to the unique tool and inspection and repair device for manufacture of microelectronic elements.

"The reason is that we have not received, or have received late, the money and machines needed for development, and there are very few of us for the many tasks at present," explained Akos Herman, developmental chief engineer. "We would need another several hundred design engineers to adopt the licenses,

bring modern mask manufacture here as soon as possible with computer design and development and accelerate the development of equipment-oriented circuits--that is, circuits developed for the ad hoc needs of the customer--which would greatly improve the economicalness of IC manufacture. When the central program started we were counting on supplementing our staff with experts from the KFKI. But so far these knowledgable, well-trained experts have not come to the MEV. A part may be played by prestige and the great distance, for we are working on the edge of the city, but it is also true that they would have been worse off materially--it is in vain to give them tasks which are nice professionally."

"We are trying now to ease this tension by giving special pay to engineers developing integrated circuits and we want to encourage our best designers with various competitions and by buying individual circuit designs," noted Jozsef Nemeth, deputy director general. "We are also moderating our existing backwardness in development by--in addition to other measures--starting this year a joint undertaking with Elektromodul in the center of the capital. There will be a computer there also, and our engineers, together with the experts of the user enterprises, can develop designs for integrated circuits on the spot, and they may make use of other services as well."

"What does the balance of the investment show thus far?"

"Although our enterprise is still very new we operated at a profit even last year, thanks to economical machine and test instrument manufacture. So, foreseeably, we will be able to pay back the state loan even with a 17 percent annuity payment oblitation. Naturally we are not 'loading' the burdens of development directly on the new IC products. For this reason, the domestic users will be able to buy the Hungarian IC's 10 percent more cheaply than our present export prices. In the longer run, our prices will be adjusted to the import prices."

So what does this development mean to the economy in this year alone? Even this year domestic chip manufacture--just getting started--and the increasing socialist import will replace capitalist import worth several million dollars. In the meantime, some of the products of the MEV will be exported to various capitalist firms and the assortment of domestic IC's will be expanded by virtue of socialist assortment exchange.

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LOCAL COMPUTER INDUSTRY CALLED OBSTACLE RACE

Budapest MAGYAR HIRLAP in Hungarian 21 Mar 84 p 7

[Article by Ilona Kocsi: "Computer Technology Achievements and Problems--National Anomalities"]

[Text] The shortest distance between two Hungarians is a foreigner. This statement may be an exaggeration, but certainly to the point. At least, until recently, it was definitely true.

The group was composed of mostly Hungarians, but there was a young Italian research scientist and an East German economist. When the subject of computer technology came up, we, Hungarians, complained that we were far behind the world leaders. The Italian was surprised, since only good things are published about Hungarian software abroad. He himself happened to be in Hungary on computer business and wanted to buy one of the application programs of the M-Prolog programming language for his institute. This is a Hungarian development, many world famous companies were surpassed by the Hungarians in this area.

M-Prolog? There was a confused silence. This embarrassing silence said a great deal about Hungarian computer technology culture. Because, although those present were not experts, many of them studied FORTRAN at the university and were familiar with BASIC.

Moreover, one of them, upon hearing about Prolog, mentioned the Japanese fifth generation computers, on which Prolog based on mathematical logic will be used. At this point, comparing the Japanese to the Hungarian computer industry appeared somewhat ridiculous: We could hardly believe we had anything to do with the Japanese development. Since then, SCI-L, a subsidiary of the computer technology Coordination Institute (SZKI) confirmed it: M-Prolog is a Hungarian development, thanks to two researchers of SZKI, and thus, a business contract with the Japanese became possible.

Near the Leading Edge

Thus the news is true. In many areas, the disadvantage of Hungarian computer technology relative to the leading edge of technology is not as great as we think. Moreover, in software, i.e., in the preparation of programs, machine language development, we can compete with the leaders. And in M-Prolog, we

are six to eight years ahead of the international research and development institutes. But the programs require good computers. And in this area, the picture is contradictory: Shops selling secondhand goods are filled with a large variety of computers, while hardly any of them is Hungarian made. This is a good indicator of Hungarian computer manufacturing. Three SCI-L experts individually and together contest this statement. Below are the views of one of them:

Gyozo Kovacs, president of the subsidiary, argues that we live in a country where foreign products are always valued more than domestic ones. In the case of computers, I must admit, once there was a reason for this unfavorable comparison, but today there is hardly any basis left for it. We are manufacturing three kinds of professional personal computers, which are at the same or almost at the same level as those available at the international market. But the foreign machines have more software. We can catch up with them if we accelerate the pace. Manufacturing limitations are a much more serious problem. Not profitability, as is usually the case, but the capacity of the investing companies. There are not enough floppy disks available, and Orion cannot produce enough CRT screens. (Last year, there had been 400 printers ordered, and the Telephone Factory delivered only 60.) With this kind of background it is difficult to compete. A computer normally becomes obsolete within three years. Large companies in the West, e.g., IBM, stay fast and modern by manufacturing everything they possibly can on their own. And they can choose from a very different supplier background than we can...

Opportunity and Demand

In the showroom of the SCI-L, three personal computers of the company are displayed: the MX08X, a Proper-8 and a Proper-16. Dr Imre Margitics, vice director, and Tibor Nemeti, deputy director, quote the technical specifications, proving that the machines are modern not only in appearance. The first model was still a year and a half behind the comparable western machine, but the last one only six to eight months. Thus, although they joined the personal computer business a little late, in 1982, they started at a high speed. Thus, last year, they already sold 300 in-house developed machines. The MIM subsidiary of Labor and the SCI-L, i.e., two small companies, "burst" on the domestic market place free of the red tape typical of large enterprises and with a momentum uncharacteristic in Hungary. "Burst" may not be the best choice of words, it is a fact, however, that there is strong competition from foreign computers, which mostly arrive to the country via private channels. According to plans, 1000 will be sold this year. We think we can obtain that many subcomponents, indispensable parts.

The demand is greater...

Although up to this point, we only mentioned the worrisome aspects of the domestic industrial background, we should not forget the import ban either, the infamous COCOM list. Although only ten percent of the SCI-L personal computer parts come from a capitalist country, these are badly needed. This time their acquisition is not hindered by the lack of foreign currency, but by the fact that the most modern units are on an export ban list, i.e., cannot be exported to socialist countries. Thus it is difficult to remain competitive and expect

the manufacturers to be up to date. Furthermore, the Hungarian computers are two or three times more expensive than the corresponding foreign models. Tibor Nemeti says with reference to the quantity of the series: It is not unimportant whether we must produce or buy 300 or 300 thousand components. The price is different by an order of magnitude. Thus the Hungarian products cannot be expected to follow the international trend and become less and less expensive.

The conversion of national development to sellable products is much like an obstacle race. It is already a great achievement that it can take the obstacles nicely one by one. Thus it is not surprising that achievements which brought international recognition are not in hardware, i.e., the manufacture of machines, but rather in software, the production of user programs. In this area, it is enough for a company to have good experts, capable of producing programs, which satisfy demands. But even in this area we are not in synch with the rest of the world: Abroad, machine time is cheap and the cost of labor is high, while in our country the reverse is true. This can result in anomalities in the case of software export: In the West, what matters is that the programmer can prepare the program as quickly as possible. In our country, the preparation of a good program can take a long time, but the programmer must be able to save machine time. It does not matter how long the engineer is working on it... According to Gyozo Kovacs, it is impossible to satisfy these two different work cultures. Thus an export-oriented company--SCI-L is one of those--must work in agreement with the international experience. True, this can only be accomplished via compromises. Once they came to grief: One of their western partners offered them a generator capable of creating programs. In the West, this is the cheapest way, in our country it almost resulted in bankruptcy. True, it required no personnel, but it "ate" hours of machine time. It turned out, they soon had to give up this "advantageous" gift...

Reversed Situation

Taking into account some other differences: In the West, 70 to 80 percent of the computers used is not owned by the user company. Only 20 to 30 percent of them decides on buying. In our country, the opposite is true. Granted, had a user decided on leasing in the past five years, he could not have done so. Only now are computer firms prepared to lease. Last year, SZKI established the Skitel subsidiary, which must manage on leasing.

Their credit covers the leasing of 20 machines. The demand is greater than this. But this approach would be advantageous for all: Users do not always need computers and often need a different one and the rental companies could enjoy the security of rental income. Because--as the experts put it--it is impossible to predict the number of machines coming to our country via one channel or another...

The sales brochure of the company proclaims: "Each machine is as profitable as much as it is used." From this viewpoint, computers in Hungary are worth little. And this is not because the domestic machines are not modern.

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